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Fig. 10. Empty conidium.
11. Mass of zoöspores just escaped and still fastened together.
12. The same breaking apart.
13. Zoöspore swimming free. One cilia represented. Two or three doubtfully observed.
14. Zoöspore rounded up and at rest.
15. Zoöspore germinating.
16. Oöspore in section, × 640.

Figs. 17–24, *Peronospora hydrophylli*, n. sp.

17. Conidiophore, average size, × 224.
18. Mycelium, with haustoria and cells of the host penetrated by them, × 224.
19. Stomate, with five conidiophores extending from it, × 224.
20, 21. Oöspores in section, × 640.
22–24. Germinating conidia.

SOME PERONOSPORACEÆ IN THE HERBARIUM OF THE DIVISION OF VEGETABLE PATHOLOGY.

By W. T. Swingle.

Finding a number of interesting species of Peronosporaceæ in the herbarium of the Division of Vegetable Pathology, I have decided to report on all specimens there represented that have not been mentioned previously. I have included a number of interesting forms collected during the past year, but have excluded all specimens in exsiccati as they are already known to most students of the group. I have included every collection, even of the most common species, because the record of date and locality may, even in such cases, prove of value in the future. Every specimen has been examined for oöspores and they have been reported whenever found. Nothing is mentioned in the paper that is not represented by a specimen in the herbarium.

ALBUGO (Persoon, §).

S. F. Gray. A natural arrangement of British plants, vol. 1, 1821 p. 540, No. v, p. 155.
1801. *Uredo* §*Albugo*, Persoon. Synopsis method. fungorum, p. 223.
1847. *Cystopus*, J. H. Léveillé, Sur la disposition méthodique des Urédinées. <Ann. des Sci. Nat., 3e sér., Botanique, tome 8, Paris, 1847, p. 371.

There seems to be no doubt that the generic name *Cystopus* must be abandoned in favor of *Albugo*, which has twenty-six years priority. There can be no question as to the identity of the two genera. Gray includes *Albugo* in the subfamily *Cœomideæ* which he describes thus:

> Sporidia dust-like, free, heaped, sessile or pedicelled, one or many celled, growing at first under the epidermis of living plants, then bursting through it, naked or covered with a false peridium or thecæ formed of the epidermis of the plant on which it grows.*

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*Loc. cit., p. 532.

Rœstelia, *Æcidium*, *Ustilago*, *Uredo*, and *Albugo* are included in this subfamily. The genus is described as follows:

> v. 155. *Albugo,* Persoon.—Sporidia globular, sessile, one-celled, inclosed in the bullated epidermis of live plants.—White.*

The species *Albugo cruciferarum*, Gray (*Albugo candida* (Pers.) O. Kuntze), *Albugo tragopogi* (Pers.) Gray, and *Albugo petroselini* (DC.) Gray, are included under *Albugo.* Thus not only is the genus unmistakably characterized in the description, but all the species included, excepting possibly *A. petroseleni*, are still retained in the genus. Otto Kuntze in his "Revisio generum plantarum," issued in 1891, has restored *Albugo.* I may say that I had already decided that the change was necessary. It is a fortunate accident that the older name proves to be one so well adapted. It was long used as a subgeneric name for white rusts. Berkeley, writing in 1848, says:

> Dr. Léveillé has described the genus under the name of *Cystopus* with very correct characters. It is to be wished, however, that he had adopted Schweinitz and Rabenhorst's sectional name of *Albugo* (Rab. Crypt. Fl., vol. 1, p. 13), which is far more expressive; and as a general principle sectional names ought certainly to be adopted when the sections are raised to the rank of genera.†

1. Albugo candidus (Persoon) O. Kuntze. Revisio generum plantarum, Pars II, 1891, p. 658, footnote 1.

1791. *Æcidium candida,* Persoon. <Gmelin, Caroli a Linné Systema nat., ed. 13, tome 2, pars 2, 1791, p. 1473.

1847. *Cystopus candidus* (Persoon), Lévéille. Sur la dispos. méthod. des Urédinées. <Ann. Sci. Nat., 3e sér., t. 8, 1847, p. 371.

Conidia on leaves, stems, and inflorescences, oöspores in stems and inflorescences of Cruciferæ.

On *Cardamine ludoviciana*, Meyer. S. M. Tracy, March 21, 1888, Starkville, Oktibbeha County, Miss. Conidia only, on radical leaves.

On *Dentaria diphylla*, L. L. M. Underwood. May, 1889, Dryden, Tompkins County, N. Y. Conidia and immature oöspores on leaves.

On *Sisymbrium canescens*, Nutt. F. D. Kelsey, April, 1888, Billings. Yellowstone County, Mont. Conidia only, on cauline leaves. F. D. Kelsey, No. 15, June, 1888, Helena, Lewis and Clarke County, Mont. Conidia only, on cauline leaves.

On *Sisymbrium linifolium*, Nutt. F. W. Anderson, No. 9, May 17, 1887, Helena, Lewis and Clarke County, Mont. Conidia only, on stems and cauline leaves.

On *Brassica alba*, L. E. M. Fisher, No. 88, August, 1890, Urmeyville, Johnson County, Ind. Conidia only, on cauline leaves.

On *Brassica nigra*, Koch. T. A. Williams, No. 274^a, June, 1890, Weeping Water, Cass County, Nebr. Conidia only, on leaves. E. M.

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* Loc. cit., p. 540.

† Berkeley, M. J. On the White Rust of Cabbages. <Jour. Hort. Soc., London, vol. 3, London, 1848, pp. 269–270 (p. 8 of reprint).

Fisher, No. 72, July 22, 1890, Urmeyville, Johnson County, Ind. Conidia only, on cauline leaves.

On *Nasturtium sessiliflorum*, Nutt. S. M. Tracy, July 11, 1887, Wadsworth, Washoe County, Nev. Conidia only, on leaves, stems, and capsules.

On *Nasturtium armoracia*, Fries. B. T. Galloway, May, 1887, Boone County, Mo. Conidia only, on stems, flowers, and on radical and cauline leaves.

On *Capsella Bursa-pastoris*, Moench. W. T. Swingle, No. 4000, May 2, 1891, Alexandria, Alexandria County, Va. Conidia only, on leaves, stems, and inflorescences; oöspores, immature in stems. W. T. Swingle, No. 4002, May 22, 1891, Norfolk, Norfolk County, Va. Conidia on capsules; oöspores mature, abundant, in stems and infloresences. B. T. Galloway, June 13, 1888, Washington, D. C. Conidia on leaves and stems; oöspores immature in stems. M. B. Waite, No. 333, November 17, 1888, Department Agriculture grounds, Washington, D. C. Conidia only, on radical leaves.

On *Lepidium Virginicum*, L. M. B. Waite, No. 259, May 13, 1888, Oregon, Ogle County, Ill. Conidia only, on cauline leaves.

On *Lepidium* (sp. ?) H. W. Ravenel, No. 291b, 1869, Houston, Harris County, Tex. Conidia only, on leaves. T. A. Williams, No. 274^b, June, 1890, Weeping Water, Cass County, Nebr. Conidia only, on radical leaves.

On *Lepidium campestre*, Br. W. T. Swingle, No. 4003, May 31, 1891, low ground by monument, Washington, D. C. Conidia and mature oöspores in stems.

On *Raphanus sativus*, L. E. M. Fisher, No. 83, July 25, 1890, Urmeyville, Johnson County, Ind. Conidia only, on both sides of radical leaves. E. M. Fisher, No. 83, August, 1890, Urmeyville, Johnson County, Ind. Conidia and oöspores in enormously distorted flowers.

2. **Albugo portulacæ** (De Candolle) O. Kuntze, loc. cit., 1891, pars. II, p. 568.

1815. *Uredo portulacæ*, De Candolle. <Lamarck et De Candolle, Fl. française, t. V ou vol. VI, p. 88, No. 637.

On leaves of Portulacaceæ.

On *Portulaca oleracea*, L. T. A. Williams, No. 255, June 18, 1890, Weeping Water, Cass County, Nebr. Conidia and mature oöspores in leaves. S. M. Tracy, July 10, 1888, Starkville, Oktibbeha County, Miss. Conidia and mature oöspore in leaves. M. B. Waite, No. 127, August 8, 1885, Oregon, Ogle County, Ill. Conidia only. E. M. Fisher, No. 163, August, 1890, Urmeyville, Johnson County, Ind. Conidia only. M. B. Waite, (Herb. Div. Veg. Path. No. 377), September 19, 1889, Champaign, Champaign County, Ill. Conidia and mature oöspores in leaves. G. W. Clinton, 18—, Buffalo, Erie County, N. Y. Conidia only.

3. **Albugo tragopogonis** (Persoon) S. F. Gray, Nat. Arrang. Brit. Plants, vol. I, 1821, p. 540.

1801. *Uredo* (*Albugo*) *candidus* Pers. *β. Uredo Tragopogonis*, Persoon. Syn. meth. fung. I, p. 223, No. 348.

1886. *Cystopus Tragopogonis* (Persoon) Schroeter. Die Pilze Schlesiens, Hälfte I, p. 234.

On leaves of Compositæ.

On *Helianthus* (sp. ?). C. A. Hart, July 12, 1883, Quincy, Adams County, Ill. Conidia and mature oöspores in leaves. C. A. Hart, July 17, 188–, West Quincy, Adams County, Ill. Conidia and mature oöspores in leaves. I am inclined to think the host is *Iva ciliata*, but can not be certain. As far as I know *A. tragopogonis* is unknown on *Helianthus*, although it is abundant in some places on *Iva ciliata*.

On *Franseria discolor* Nutt. (?). S. M. Tracy, September 10, 1887, Denver, Arapahoe County, Colo. Conidia on stems and leaves, oöspores mature, in leaves.

On *Ambrosia artemisiæfolia*, L. A. B. Seymour, August 12, 1885, Granville, Hampden County, Mass. Conidia and mature oöspores on leaves.

On *Ambrosia* (sp. ?). S. M. Tracy, June 21, 188–, Coolidge, Bernalillo County, N. Mex. Conidia only, on leaves.

On *Artemisia biennis*, Willd. B. D. Halsted, 1885, Spirit Lake, Dickinson County, Iowa. Conidia only, on leaves.

On *Senecio serra*, Hook., var. *integriusculus*, Gr. F. D. Kelsey, July 9, 1888, Helena, Lewis and Clarke County, Mont. Conidia and mature oöspores in leaves.

On *Cnicus horridulus*, Pursh. W. T. Swingle, No. 4004, May 22, 1891, Norfolk, Norfolk County, Va. Conidia and mature oöspores in leaves.

On *Cnicus lanceolatus*, Hoffm. G. W. Clinton, 18—, Buffalo, Erie County, N. Y. Conidia only, on leaves.

On *Tragopogon pratensis*, L. W. A. Kellenman, No. 10^{h}, July 15, 1880, Göttingen, Germany. Conidia only, on leaves.

On *Tragopogon porrifolius*, L. G. W. Clinton, 18—, Buffalo, Erie County, N. Y. Conidia only, on leaves.

4. **Albugo ipomœæ-panduranæ** (Schweinitz) Swingle.

1822. *Aecidium Ipomoeae-panduranae*, Schweinitz. Synopsis fung. Carol. No. 454. <Schriften der naturforschenden Gesells. zu Leipzig, Bd. I, p. 69.

1889. *Cystopus ipomoeae-panduranae* (Schw.) Stevs. & Swingle. List of Kansas species of Peronosporaceae, No. 2. <Trans. 20th and 21st meetings Kan. Acad. Sci., vol. XI, p. 67.

Conidia on leaves and stems, oöspores in stems and petioles of Convolvulaceæ.

On *Convolvulus?* (sp. ?). Conidia only, on leaves. W. T. Swingle, No. 4005, July 8, 1891, Eldorado, Lake County, Fla. Conidia only, on leaves. W. T. Swingle, No. 4006, July 13, 1891, Eldorado, Lake County, Fla. Conidia only, on leaves.

On *Ipomœa Batatas*, Lam. D. G. Fairchild, September 17, 1889, Vineland, Cumberland County, N. J. Conidia only, on leaves.

On *Ipomœa commutata*, R. and S. W. T. Swingle, No. 4007, June 15, 1891, Griffin, Spalding County, Ga. Conidia only, on leaves, stems, and peduncles. A. B. Langlois, No. 602, August 6, 1886, Pointe à la Hache, Plaquemine Parish, La. Conidia only, on leaves.

On *Ipomœa hederacea*, Jacq. Erwin F. Smith, July 9, 1890, Talbot County, Ga. Conidia only, on leaves. A. B. Langlois, No. 598, July 27, 1886, Pointe à la Hache, Plaquemines Parish, La. Conidia only, on leaves.

On *Ipomœa incarnata*, Vahl. C. S. Sheldon, No. 230, July 28, 1891, Quanah. Indian Territory, com., J. M. Holzinger. Conidia only, on leaves and stems. Mr. J. M. Holzinger kindly called my attention to this new host for the species. Only two plants were sent by Mr. Sheldon, and both showed the unusually large sori on the stems and on nearly all the leaves.

On *Ipomœa leptophylla*, Torr. E. Bartholomew, No. 433, July 20, 1891, Rockport, Rooks County, Kans. Conidia on swollen stems and leaves, immature oöspores in swollen stems.

On *Ipomœa pandurata*, Meyer. S. M. Tracy, July 1, 1888, Starkville, Oktibbeha County, Miss. Conidia only, on leaves. M. B. Waite, No. 258, September 10, 1888, Oregon, Ogle County, Ill. Oöspores only, in swellings on stems and leaves. The leaves often show a number of spots 5–20 mm. in diameter that are bulged and corrugated and literally filled with nearly mature oöspores. Possibly the leaf spots would have shown some conidia earlier in the season. E. M. Fisher, No. 201, September, 1890, Urmeyville, Johnson County, Ind. Conidia and nearly or quite mature oöspores in bullated corrugated spots on the leaf. Much like Waite's, No. 258.

On *Ipomœa lacunosa*, L. L. F. Ward, Sept. 7, 1879, Alexandria County, Virginia. Conidia only, on leaves.

On *Ipomœa* (sp?). S. M. Tracy, September 13, 1888, Durant, Holmes County, Miss.

5. **Albugo platensis** (Spegazzini) Swingle.

1883. *Cystopus amarantacearum*, Zalewski. Zur Kennt. der Gatt. Cystopus Lév. Vorläufige Mittheilung. <Bot. Centralb., iv Jahrg. 1883, iii quartal Bd. xv, p. 223, pro parte.

1891. *Cystopus platensis*, Spegazzini. Phycomyceteae Argentinae, No. 15. <Revista Argentina de Historia Natural, tomo I, entrega 1ª, Buenos Aires, Feb. 1.º, 1891, p. 32.

Conidia on upper surface of leaves of Nyctaginaceæ. No oöspores found.

On *Allionia incarnata* L. S. M. Tracy, June 18, 1887, dry hills, 1 mile east of Albuquerque, Bernalillo County, N. Mex. Bilimek, No. 167, Sept. 21, 1869, Chapultepek, Mexico, Ex. Herb. Bot. Div. Dept. Agric. From Herb. Mus. Paris.

On *Boerhaavia diffusa*, (?) L. Newberry in McComb's expedition, sandy river bottoms, 1859, N. Mex., Colo., or Utah. Ex. Herb. Bot. Div. Dept. Agric.

On *Boerhaavia erecta*, L. Schott, No. 478, June 12, 1865, Merida, Yucatan, Mexico. Ex. Herb. Div. Bot. Dept. Agric. Edward Palmer, 1885, S. W. Chihuahua, Mexico. Ex. Herb. Bot. Div. Dept. Agric. Edw.

Palmer, No. 680, 1887, Los Angeles Bay, Guaymas, Mexico. Ex. Herb. Bot. Div. Dept. Agric. J. H. Simpson, July 11, 1890, Sarasota Bay, Manatee County, Fla. Ex. Herb. Bot. Div. Dept. Agric. W. T. Swingle, No. 4008, July 4, 1891, Eldorado, Lake County, Fla. W. T. Swingle, No. 4009, July 13, 1891, common on sandy land along railroad, Eldorado, Lake County, Fla.

On *Boerhaavia hirsuta*, Willd. Schott, No. 21, Feb. 12, 1865, Merida, Yucatan, Mexico. Ex. Herb. Bot. Div. Dept. Agric. W. T. Swingle, No. 4010, July 13, 1891, Eldorado, Lake County, Fla. The host may not be this species, as it was too young for positive determination.

On *Boerhaavia Sonoræ*, Rose. Edw. Palmer, September 16–30, 1890, Alamos de Calorce, Mexico. Ex. Herb. Bot. Div. Dept. Agric.

On *Boerhaavia spicata*, Choisy. Geo. Vasey, 1881, Las Cruces, N. Mex. Ex. Herb. Bot. Div. Dept. Agric.

On *Boerhaavia viscosa*, Lag. et Rodr. Reverchon, No. 791, June, 1880, Dallas, Dallas County, Tex. Ed. Palmer, No. 212, Aug. to Nov., 1885, S. W. Chihauhua, Mex.

On *Boerhaavia Xanthii*, Watson. Edw. Palmer, No. 681, 1887, Guaymas, Sonora, Mexico. Ex. Herb. Bot. Div. Dept. Agric.

I found this interesting *Albugo* in Florida during the summer of 1891, and upon my return to Washington examined the specimens of Nyctaginaceæ in the herbarium of the botanical division of the Department of Agriculture, through the kindness of Dr. George Vasey and Mr. J. N. Rose. I was agreeably surprised to find many specimens here, as may be seen from the foregoing list. I am much in doubt as to the identification of the material, and would not publish this notice if it were not largely with the hope that it may call forth further observations and perhaps result in the finding of oöspores.

The first mention I have found of *Albugo* occurring on nyctaginaceous plants is by Zalewski,* in 1883, who reports an *Albugo* on Boerhaavia from Ceylon and from La Plata which he refers to his *Cystopus amarantacearum* (=*Albugo amaranthi* (Schw.) O. Kze.), on the strength of the conidial characters, since he was unable to find oöspores. In speaking of this form he says: "die Conidien sind aber hier von denen von C. Amarantacearum gar nicht zu unterscheiden." I find, however, that the specimens reported above (also lacking oöspores) seem to differ constantly from *Albugo amaranthi* in several points. First, the conidia are in every case yellowish as seen in mass, being almost exactly of the color of those of *A. portulacæ* and unlike those of *A. amaranthi*, which are white. Second, the terminal conidium shows in every case a very much thicker internal equatorial band which is dusky or even brown in color, while a similar structure in *A. amaranthi* is colorless or nearly so. Very possibly further differences will be found to exist, since I have not had time to make an exhaustive examination of the two species. These constant differences, together with the failure to find oöspores in all specimens studied and the fact that the fungus is parasitic on a different, although related, family of plants, make me hesitate to refer it to *A. amaranthi.*

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* Zur Kennt. der Gatt. Cystopus Lév. Vorläufige Mitt. in Bot. Centralb., loc. cit., pp. 222–223.

In 1880 Spegazzini* included in *Cystopus cubicus* (=*Albugo tragopogonis* (Pers), O. Kze.), a form occurring on leaves of *Boerhaavia erecta* found at Barracas del Sur, Argentine. Our species, however, appears to differ from *A. tragopogonis* in at least the following ways: First, in having spores yellowish in mass; second, in having the terminal conidia smaller than the others; and, third, in the conidia having a dusky-brown equatorial band. Besides this the families of the host plants are not at all closely related, and from this fact alone it is probable that the species are distinct.

The next reference I find to an Albugo on Nyctaginaceæ is by Spegazzini,† who, in 1891, described a new species, *Cystopus platensis,* on Boerhaavia from Argentine. As his description may not be accessible to all interested, I quote in full:

> 15. Cystopus platensis Speg. (n. sp.)-Fung., Arg. pug. I, n. 68 (sub *C. cubico*).
>
> *Hab.* In foliis vivis *Boerhaviae hirsutae* prope Buenos Aires (1880), et prope Córdoba (1887).
>
> *Obs.* Sori hypophylli macula primo pallescente dein purpurascente cincti, irregulares minuti (1–2 mllm. diam.) sparsi v. hinc inde laxe gregarii, vix prominuli candidi diu epidermide velati, dein erumpentes ac pulverulenti; conidia globoso-cuboidea (20–22 × 18–20μ) hyalina catenulata, minute densissimeque punctulata (an tantum granuloso farcta?), suprema ovata obtusa; cellulae basales steriles obconico-turbinatae (40–45 × 12–15μ) crasse tunicatae per aetatem flavescentes. Oosporae ignotae. Species praecedenti [*C. bliti* on Amaranthaceæ] peraffinis sed conidiis punctulatis majoribus satis, ut videtur, recedens.

The conidia of the preceding species are given as 16–18 × 15–17μ.

6. **Albugo amaranthi** (Schweinitz) O. Kuntze. Rev. gen. Pl. I, vol. II. p. 658, footn. 1.

1834. *Caeoma* [§ *Uredo* (*Albugo*)] *Amaranthi,* Schw. Syn. fung. Am. Bor.,No. 2853. <Trans. Am. Phil. Soc., Phila., new ser., vol. IV, p. 292.

1874. *Cystopus Amaranthi* (Schw.) Berkeley. Notices of N. Am. Fungi, No. 571. <Grevillea, vol. III, London, No. 26, December, 1874, p. 58.

Conidia and oöspores in leaves of Amarantaceæ.

On *Amarantus chlorostachys,* Willd. W. T. Swingle, No. 4011, June 26, 1891, Baldwin, Duval County, Fla. Conidia only, on leaves.

On *Amarantus chlorostachys,* var. *hybridus.* Wats. E. M. Fisher, No. 84, July 25, 1890, Urmeyville, Johnson County, Ind. Conidia and mature oöspores in leaves. E. M. Fisher, No. 84, August, 1890, Urmeyville, Johnson County, Ind. Conidia and mature oöspores in leaves.

On *Amarantus crispus,* Braun. S. M. Tracy, May 26, 1888, Starkville, Oktibbeha County, Miss. Conidia and mature oöspores in leaves.

On *Amarantus spinosus,* L. W. T. Swingle, No. 4012, June 26, 1891, Baldwin, Duval County, Fla. Conidia and mature oöspores in leaves.

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* Spegazzini, Fungi Argentini. Pugillus primus, No. 67. <Ann. Soc. Cientifica Argentina, tomo IX, Abril de 1880, Buenos Aires, p. 177.

† Spegazzini, Dr. Carolus. Phycomyceteae Argentinæ. <Revista Argentina de Hist. Nat., t. I, Buenos Aires, Feb. 1, 1891, p. 32.

On *Amarantus retroflexus*, L. E. M. Fisher, No. 37, July 18, 1890, Urmeyville, Johnson County, Ind. Conidia only, on leaves. C. A. Hart, August 2, 1883, Quincy, Adams County, Ill. Conidia and mature oöspores in leaves. E. M. Fisher. No. 37, August, 1890, Urmeyville, Johnson County, Ind. Conidia only, on leaves. M. B. Waite, No. 124, August 8, 1885, Oregon, Ogle County, Ill. Conidia and mature oöspores in leaves. E. Bartholomew, No. 88, August 10, 1888, Rockport, Rooks County, Kans. Conidia and mature oöspores in leaves. J. J. Davis, September 3, 1887, Racine, Racine County, Wis. Conidia only, on leaves. M. B. Waite, (Herb. Div. Veg. Path. No. 45), September 5, 1889, Lansing, Ingham County, Mich. Conidia and mature oöspores in leaves.

On *Amarantus* (sp. ?). G. W. Clinton, 18—, Buffalo, Erie County, N. Y. Conidia and oöspores in leaves. T. A. Williams, No. 324, July 15, 1890, Ashland, Saunders County, Nebr. Conidia and mature oöspores in leaves.

7. **Phytophthora infestans** (Montaigne) De Bary. Research into Nature of Potato Fungus. <Jour. Roy. Agric Soc., 2d ser., vol. XII, London, 1876, pp. 239-269.

1845. *Botrytis infestans*, Montaigne. <Jour. l'Inst., 1845, p. 313; also <Bull. Soc. Philomath. de Paris. Séance du 30 Août, 1845.

On leaves of Solanaceæ.

On *Solanum tuberosum*, L. A. B. Seymour (No. 5623, Herb. Ill. State Lab. Nat. Hist.), August 7, 1882, Camp Point, Adams County, Ill. E. A. Southworth, September 15, 1891, Smiths Mills, Chautauqua County, N. Y. W. T. Swingle, No. 4013, September 20, 1891, Garrett Park, Montgomery County, Md. This fungus was quite abundant in a field at this place and seriously injured at least the tops of the plants.

8. **Sclerospora graminicola** (Saccardo) Schroeter. Die Pilze Schlesiens I, 1886, p. 236, No. 352.

1876. *Protomyces graminicola*, Saccardo. Fungi veneti novi vel critici ser. VI, No. 91, <Nuovo giorn. bot. ital., vol. VIII, 1876, p. 172.

On leaves and inflorescences of Gramineæ.

On *Setaria viridis*, Beauv? Tom A. Williams, No. 257, August, 1889, Weeping Water, Cass County, Nebr. Conidia (?) and oöspores in leaves and in the distorted spikelets.

9. **Plasmopara pygmæa** (Unger) Schroeter. Die Pilze Schlesiens, I, 1886, No. 359, p. 239.

1833. *Botrytis pygmaea* Unger. Die Exanthemen der Pflanzen, pp. 172-173.

On leaves of Ranunculaceæ. Conidiophores hypophyllous on radical leaves.

On *Anemone Pennsylvanica*, L. C. A. Hart, May, 1884, Normal, McLean County, Ill.

On *Hepatica acutiloba*, DC. J. J. Davis, May 13, 1887, Racine, Racine County, Wis.

10. **Plasmopara geranii** (Peck). Berl. & De Toni. <Sacc. Sylloge fungorum, vol. VII, Part I, 1888, p. 242, No. 811.

1879. *Peronospora Geranii*, Peck. Rept. Botanist, in 28th Rept. N. Y. State Mus. Nat. Hist., p. 63.

On leaves of Geraniaceæ. Conidiophores always hypophyllous.

On *Geranium Carolinianum*, L. S. M. Tracy, March 11, 1888, Starkville, Oktibbeha County, Miss. M. B. Waite, No. 553, March 17, 1889, High Island, Montgomery County, Md. M. B. Waite, No. 555, April 10, 1889, High Island, Montgomery County, Md. F. S. Earle, April 28, 1883, Anna, Union County, Ill. Erwin F. Smith, May 11, 1889, dry fields, Still Pond, Kent County, Md. B. T. Galloway, May 17, 1891, Garrett Park, Montgomery County, Md. D. G. Fairchild, May 21, 1889, New Brunswick, Middlesex County, N. J. W. T. Swingle, No. 4014, May 22, 1891, Norfolk, Norfolk County, Va. B. T. Galloway, May 23, 1877, Boone County, Mo.

On *Geranium maculatum*, L. B. T. Galloway, July 4, 1888, Washington, D. C. With a few nearly mature oöspores in leaves.

11. **Plasmopara obducens**, Schroeter. Die Pilze Schlesiens, I, p. 238, 1886, No. 356.

1877. *Peronospora obducens*, Schroeter. <Hedwigia Bd. XVI, 1877, No. 9, p. 129–135.

On leaves and cotyledons of Geraniaceæ. Conidiophores hypophyllous.

On *Impatiens fulva*, Nutt. E. M. Fisher, No. 55, July 22, 1890, Needham, Johnson County, Ind. With very immature oöspores in leaves.

On *Impatiens* (sp.?). (*I. fulva* or *I. pallida.*) M. B. Waite, No. 551, April 10, 1889, Rosslyn, Alexandria County, Va. B. T. Galloway, May 3, 1891, Garrett Park, Montgomery County, Md. C. A. Hart, May 10, 1884, Bloomington, McLean County, Ill. J. J. Davis, May 15, 1887, Racine, Racine County, Wis. P. H. Dorsett, May 21, 1891, Benning's Station, Md.

12. **Plasmopara viticola** (Berkeley & Curtis) Berl. & De Toni. <Saccardo, Sylloge fungorum, vol. VII, Part I, p. 239. No. 806. 1888.

1860. *Botrytis viticola*, Berk. & Curt. <Ravenel Fungi Caroliniani Exsiccati. Fungi of Carolina, illustrated by natural specimens of the species, by H. W. Ravenal, Charleston. Cent. V., No. 90.

On leaves of Vitaceæ.

On *Vitis aestivalis*, Michx. M. B. Waite, No. 123, August 3, 1885, Oregon, Ogle County, Ill. M. B. Waite, No. 182, September 10, 1889., Oregon, Ogle County, Ill. M. B. Waite, No. 544, September 15, 1888, Oregon, Ogle County, Ill. W. T. Swingle, No. 4015, October 10, 1891, Still Pond, Kent County, Md.

On *Vitis cinerea*, Engelm. (?) E. M. Fisher, No. 89, July 18, 1890, Urmeyville, Johnson County, Ind.

On *Vitis cordifolia*, Michx. C. A. Hart, July 18, 1883, La Grange, Lewis County, Mo. E. M. Fisher, No. 89, July 26, 1890, Urmeyville, Johnson County, Indiana. Herman Jaeger, August 20, 1888, Neosho, Newton County, Mo. F. S. Earle and M. B. Waite, September 19, 1885, Urbana, Champaign County, Ill. W. T. Swingle, No. 4016, October 10, 1891, Still Pond, Kent County, Md.

On *Vitis* (cultivated, hort. var. Concord). M. B. Waite, No. 273, July

23, 1888, Champaign, Champaign County, Ill. M. B. Waite, No. 545, September 25, 1888, Urbana, Champaign County, Ill.

On *Vitis* (cultivated, hort. var. Clinton). S. M. Tracy, August 23, 1887, Plattville, Grant County, Wis.

On *Vitis* (cultivated, hort. var. Niagara). H. L. Rogers, July 17, 1890, Highland, Ulster County, N. Y.

On *Vitis* (cultivated, var. unknown). B. T. Galloway, September, 1888, Dept. Agric. Grounds, Washington, D. C. M. B. Waite (Herb. Div. Veg. Path., No. 359), September 18, 1889, Champaign, Champaign County, Ill. E. M. Fisher, No. 186, September, 1890, Franklin County, Ind. With mature oöspores in leaves. W. T. Swingle, No. 4017, October 10, 1891, Still Pond, Kent County, Md. I am not certain this was a cultivated grape, as it grew by the roadside, but it seemed unlike any wild grape I know.

13. **Plasmopara australis** (Spegazzini) Swingle. A list of the Kansas species of Peronosporacae No. 9. <Trans. Twentieth and Twenty-first Meeting Kans. Acad. Sci., vol. XI, 1889, p. 72.

1881. *Peronospora australis* Spegazzini. Fungi Argentini, Pugillus I, No.—. <Anales d. l. sociedad cientifica argentina, t. XII, 1881, p. 81.

On leaves of Cucurbitaceæ. Conidiophores always hypophyllous on cauline leaves.

On *Sicyos angulatus*, L. B. T. Galloway, June, 1887, Boone County, Mo. B. T. Galloway, July 25, 1886, Boone County, Mo. E. M. Fisher, No. 171, September, 1890, Needham, Johnson County, Ind.

14. **Plasmopara viburni** Peck. Ann. Rep. State Botanist of New York, p. 28. Reprint from 43d Rept. N. Y. State Mus. Nat. Hist., Albany, 1890.

On leaves of Caprifoliaceæ. Conidiophores hypophyllous on cauline leaves.

On *Viburnum acerifolium*, L. M. B. Waite, No. 535, October 11, 1891, Cascade Run, Washington, D. C.

On *Viburnum opulus*, L. D. G. Fairchild, September 28, 1889, Breese Hill, Md. D. G. Fairchild, October, 1889, Breese Hill, Md.

15. **Plasmopara entospora** (Roze and Cornu). Berl. and DeToni. <Saccardo Sylloge fungorum, vol. VII, Part I, p. 239, No. 805.

1867. *Basidiophora entospora* Roze and Cornu. Sur deux nouv. types d. Saproleg. <Ann. d. Sci. Nat. 5^e sér. Bot., t. XI, 1869, pp. 84–89 (pp. 13–18 of reprint), Pl. 4.

On leaves of Compositæ, tribe Asteroideæ. Conidiophores hypophyllous on both radical and cauline leaves.

On *Aster Novæ-Angliæ*, L. W. T. Swingle, No. 4018, October 29, 1891, Garrett Park, Montgomery County, Md. Conidiophores on cauline leaves. Abundant.

On *Erigeron Canadense*, L. M. B. Waite, No. 121, May 13, 1885, Urbana, Champaign County, Ill. Conidiophores and abundant mature oöspores on cauline leaves.

16. **Plasmopara Halstedii** (Farl.) Berl. and DeToni. <Sacc. Syll. Fung., vol. VII, Part I, p. 242, No. 810.

1878. *Peronospora Halstedii*, Farlow. Notes on some species in the Third and Eleventh Centuries of Ellis's N. Am. Fungi. <Proc. Am. Acad. Arts and Sci., vol. XVIII, new series, vol. X, 1878, p. 72.

On leaves of Compositæ. Conidiophores hypophyllous on cauline leaves.

On *Erigeron Philadelphicum*, L. (?). B. T. Galloway, September 25, 1891, Garrett Park, Montgomery County, Md.

On *Erigeron* (sp. ?). E. W. D. Holway, July 20, 1884, Decorah, Winneshiek County, Iowa.

On *Silphium perfoliatum*, L. M. B. Waite, No. 265, September 8, 1888, Oregon, Ogle County, Ill. S. M. Tracy, September 1, 1888, Plattville, Grant County, Wis. With mature oöspores on cauline leaves.

On *Ambrosia artemisiæfolia*, L. W. T. Swingle, No. 4019, September 20, 1891, Garrett Park, Montgomery County, Md.

On *Ambrosia trifida*, L. E. A. Southworth, May 1, 1891, College Station, Prince George's County, Md. B. T. Galloway, May 13, 1888, Virginia. C. G. Hart, May 14, 1884, Normal, McLean County, Ill. P. H. Dorsett, May 16, 1891, Benning's Station, Md. M. B. Waite, No. 266, May 19, 1888, Urbana, Champaign County, Ill. M. B. Waite, No. 541, June 1, 1888, Oregon, Ogle County, Ill. C. A. Hart, July 18, 1883, La Grange, Lewis County, Mo. T. A. Williams, No. 256, August 1, 1889, Wabash County, Nebr.

On *Helianthus grosse-serratus*, Martens. M. B. Waite, No. 546, May 28, 1888, Oregon, Ogle County, Ill. Conidiophores forming a dense white coating.

On *Helianthus* (sp. ?). C. A. Hart, May, 1884, Normal, McLean County, Ill. Conidiophores attacking only the basal portion and there forming a dense white coating. M. B. Waite (Herb. Div. Veg. Path., No. 318) September 4, 1891, Oregon, Ogle County, Ill. Conidiophores on cauline leaves in rather scattered spots. F. L. Scribner, July 17, 1887, Lanier Heights, Washington, D. C. Conidiophores forming a very dense white coating on the basal portion of the diseased leaves.

On *Bidens connata*, Muhl. E. M. Fisher, No. 188, September, 1890, Urmeyville, Johnson County, Ind.

On *Bidens frondosa*, L. E. M. Fisher, No. 58, July 20, 1890, Urmeyville, Johnson County, Ind. E. M. Fisher, No. 59, August, 1890, Urmeyville, Johnson County, Ind.

On *Erechthites hieracifolia*, Raf. M. B. Waite, No. 122, August 11, 1885, Oregon, Ogle County, Ill.

17. Plasmopara gonolobi (Lagerheim) Swingle.

1891. *Peronospora gonolobi*, Lagerheim. Observations on new species of fungi from North and South America. <Jour. of Mycol., Vol. VII, p. 49.

On leaves of Asclepiadaceæ.

On *Gonolobus suberosus*, R. Br. W. T. Swingle, No. 4001, Oct. 10, 1891, Still Pond, Kent County, Md. Conidiophores only, hypophyllous. Prof. W. G. Farlow has kindly compared my specimens with a part of those from which Prof. Lagerheim described the species and pronounces them identical. The species has the typical branching of *Plasmopara*. The conidia germinate readily in water producing zoöspores which have two cilia.

Measurements of sixty conidia are herewith appended.

Table of measurements of sixty conidia of Plasmopara gonolobi (Lagerheim), Swingle.*

16½ by 15	19½ by 17¼	22½ by 18	25 by 20
16½ by 16½	20 by 17	22½ by 18	25½ by 18
18 by 15	21 by 15¾	22½ by 19½	25½ by 18
18 by 15	21 by 16½	22½ by 19½	25½ by 18¾
18 by 16½	21 by 16½	22½ by 20¾	25½ by 19½
19½ by 14¼	21 by 17¼	23 by 19	25½ by 19½
19½ by 15¾	21 by 17¼	24 by 15¾	25½ by 21¾
19½ by 15¾	21 by 17¼	24 by 19½	25½ by 22½
19½ by 16	21 by 18	24 by 19½	25½ by 24¾
19½ by 16½	21 by 18¾	24 by 19½	26¼ by 21
19½ by 16½	21 by 19½	24 by 19½	27 by 19½
19½ by 16½	21¾ by 16½	24 by 20¼	27 by 21
19½ by 16½	21¾ by 18	24 by 21	27 by 21
19½ by 16½	21¾ by 18¾	24¾ by 18¾	34½ by 24¾
19½ by 16½	22½ by 18	24¾ by 19	42 by 26

18. Bremia lactucæ, Regel. Beiträge z. Kennt. einiger Blattpilze. Bot. Zeit., 1843, p. 665.

On leaves of Compositæ, Tribe Cichoriaceæ. Conidiophores hypophyllous, on both radical and cauline leaves.

On *Krigia Dandelion*, Nutt. F. S. Earle, May 10, 1884, Cobden, Union County, Ill.

On *Lactuca Canadensis*, L. B. T. Galloway, June 1887, Columbia, Boone County, Mo.; W. A. Kellerman, No. 29, June 6, 1882, Lexington, Fayette County, Ky.; M. B. Waite, No. 120, August 26, 1885, Oregon, Ogle County, Ill.

On *Lactuca integrifolia*, Bigel. W. T. Swingle, No. 4020, September 20, 1891, Garrett Park, Montgomery County, Md.

On *Lactuca leucophæa*, Gray. W. T. Swingle, No. 4021, October 29, 1891, Rockville, Montgomery County, Md.

On *Lactuca sativa*, L. E. A. Southworth, December 8, 1891, Reeves Station, Md.

On *Lactuca* (sp.?). P. H. Dorsett, May 21, 1891, Benning's Station, Md.; F. S. Earle, June 17, 1883, Anna, Union County, Ill.; W. T. Swingle, No. 4022, September 17, 1891, Sterling, Loudoun County, Va.; M. B. Waite, (Herb. Div. Veg. Path. No. 525), September 27, 1889, Mt. Carmel, Wabash County, Ill.; W. T. Swingle, No. 4023, October 25, 1891, Bethesda Park, Montgomery County, Md.

PERONOSPORA.

Corda, Icones fungorum hucusque cognitorum, I, p. 20.

§ *Calothecæ.*

19. Peronospora arenariæ (Berkeley) Tulasne, Note sur les champignons entophytes, tels que celui de la Pomme de terre. <Compt. Rend. d. l'Acad. d. Sciences, t. 38, 26 Juin, 1854, p. 1102 and 1103.

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* These conidia were measured from fresh specimens (from Still Pond, Md., coll. Oct. 10, 1891) in water by Miss May Varney with a Zeiss F. obj. 3 oc. 169 mm. tube length. One division of the eyepiece micrometer equaled 1½ μ's. The measurements are given in μ's.

1846. *Botrytis arenariæ* Berkeley. Observations, Botanical and Physiological, on the Potato Murrain. Journ. Hort. Soc. London, vol. 1, p. 31, pl. 4, f. 22.
Var. **macrospora** Farlow. Additions to the Peronosporeæ of the United States, No. 12*, Bot. Gaz., vol. IX, No. 3, Mar., 1884, p. 38.

On *Silene* sp. (?). F. S. Earle, April 24, 1884, Anna, Union County, Ill. As no oöspores were seen the identification of this specimen is somewhat doubtful.

20. **Peronospora alsinearum** Caspary. Ueber einige Hyphomyceten mit zwei-und dreierlei Früchten, No. 8. <Bericht über die zur Bekanntmachung geeigneten Verhandlungen K. Preuss. Ak. der Wissensch. zu Berlin, 1855. Berlin, Sitzung phys. math. Klasse vom 14. Mai, 1855, p. 330.

On *Cerastium nutans* Raf. M. B. Waite, No. 262, May 19, 1888, Urbana, Champaign County, Ill. With mature oöspores in lower leaves.

On *Cerastium viscosum* L. (?). S. M. Tracy, April 1, 1888, Starkville, Oktibbeha County, Miss. With mature oöspores in stems.

On *Cerastium vulgatum*, L. S. M. Tracy, April 4, 1888, Starkville, Oktibbeha County, Miss. Conidophores very scarce, oöspores mature and abundant in stems, leaves, and calyces.

21. **Peronospora viciæ** (Berkeley) Caspary. Ueber einige Hyphomyceten mit zwei-und dreierlei Früchten. <Bericht über die zur Bekanntmachung geeigneten Verh. K. Preuss. Ak. der Wissensch. zu Berlin, 1855. Sitzung. der physik. math. Klasse vom 14. Mai, 1855, p. 330.

1846. *Botrytis Viciæ* Berkeley. Observations, Botanical and Physiological, on the Potato Murrain. <Jour. Hort. Soc. of London, vol. I, p. 31, pl. 4, fig. 23.

On leaves, stems, and inflorescences of Leguminosæ, suborder Papilionaceæ, tribe Vicieæ.

On *Vicia sativa* L. W. T. Swingle, No. 4031, May 22, 1891, along drainage ditches by roadsides, east of Norfolk, Norfolk County, Va.

On *Vicia* (sp.?). E. A. Southworth, January 13, 1890, Washington, D. C.

22. **Peronospora calotheca** De Bary. Rabenhorst, <Klotzschii herb. viv. myc., ed. 2, Cent. VII, No. 673 1858; also <Botanische Zeit., XVI Jahrg., 1858, p. 58.

On leaves of Rubiaceæ.

On *Galium aparine* L. M. B. Waite, No. 267, May 12, 1888, Urbana, Champaign County, Ill. M. B. Waite, No. 547, May 29, 1888, Urbana, Champaign County, Ill. With mature oöspores in leaves and stems. E. W. D. Holway, June 7, 1884, Decorah County, Iowa.

23. **Peronospora Arthuri** Farlow. Enumeration of the Peronosporeæ of the United States, No. 13, <Bot. Gaz., vol. VIII, October, 1883, p. 315.

On leaves of Onagraceæ.

On *Œnothera biennis*, L. E. A. Southworth, May 1, 1891, College Station, Prince George County, Md. C. A. Hart, May 15, 1883, Normal, Union County, Ill. E. W. D. Holway, June 7, 1884, Decorah, Winneshiek County, Iowa. M. B. Waite, No. 539, June 22, 1885, Oregon, Ogle County, Ill. M. B. Waite, No. 262, July 4, 1888, Champaign, Champaign County, Ill. With mature oöspores in leaves.

24. **Peronospora myosotidis** De Bary. <Rabenhorst, Fungi europæi. No. 572.

On leaves of Borraginaceæ.

On *Myosotis verna*, Nutt. F. S. Earle, April 24, 1884, Anna, Union County, Ill. With abundant mature oöspores in stems.

§ *Leiothecæ:* Subsection *parasiticæ.*

25. Peronospora corydalis De Bary. Rech. s. le développm. de quelq. cham. parasites. <Ann. Sci. Nat., 4^e^. sér., Bot. t. xx, cahier. I, Paris, 1863, p. 111, (p. 107 of the reprint).

On leaves of Fumariaceæ.

On *Corydalis* sp. (?). B. T. Galloway, May 6, 1888, Rock Creek, Washington, D. C.

On *Dicentra cucullaria*, DC. M. B. Waite, No. 554, April 20, 1889, High Island, Montgomery County, Md. With mature oöspores in leaves.

26. Peronospora parasitica (Persoon). Fries Summa veg. scand. sect. post., p. 493 (1849).

1796. *Botrytis parasitica* Persoon. Obs. mycologicæ pars. I, p. 96, t. 5, figs. 5, *a*, *b*.

On leaves and stems of Cruciferæ.

On *Dentaria heterophylla*, Nutt. M. B. Waite, No. 549, April 14, 1889, Roslyn, Alexandria County, Va.

On *Dentaria laciniata*, Muhl. E. A. Southworth, April 25, 1891, Rock Creek, Washington, D. C. With immature oöspores on leaves. B. T. Galloway, May 3, 1891, Garrett Park, Montgomery County, Md. With mature oöspores in leaves. M. B. Waite, No. 537, May, 1888, Oregon, Ogle County, Ill. Erwin F. Smith, May 8, 1889, Still Pond, Kent County, Md., with immature oospores in leaves! Some of the conidiophores have a very thick unbranched basal portion, as much as 25 μ in diameter at the base in several cases. J. J. Davis, May 20, 1887, Racine, Racine County, Wis. With immature oöspores in leaves. M. B. Waite, No. 268, June 1, 1888, Oregon, Ogle County, Ill. With mature oöspores in leaves. W. G. Clinton, 18—, Buffalo, Erie County, N. Y.

On *Draba Caroliniana* Walt. M. B. Waite, No. 269, June 1, 1888, Oregon, Ogle County, Ill. With mature oöspores in leaves.

On *Sisymbrium canescens* Nutt. Francis A. Wentz, summer, 1886 (?), Spearville, Ford County, Kans. With nearly mature oöspores in stems.

On *Lepidium intermedium* Gray. T. A. Williams, No. 287, May 30, 1890, Ashland, Saunders County, Nebr. With conidiophores on leaves, and abundant mature oöspores in leaves (!) and stems.

On *Lepidium Virginicum* L. M. B. Waite, No. 548, May 28, 1888, Oregon, Ogle County, Ill. With mature oöspores in leaves.

On *Arabis Holbœllii*, Hornem. S. M. Tracy, No. 720, August 20, 1887, Marshall Pass, Saguache County, Colo.

27. Peronospora potentillæ De Bary. Rech. s. l. développm. de quelq. champ. parasites. <Ann. Sci. Nat., 4^e^ sér. Bot., t. xx, Paris 1863, p. 124 (p. 120 of the reprint).

On leaves of Rosaceæ, Tribe Potentillæ.

On *Geum album* Gmelin. E. M. Fisher, No. 68, July 22, 1890, Needham, Johnson County, Ind.

On *Potentilla Norvegica* L. E. A. Southworth, May 1, 1891, College

Station, Prince George's County, Md. B. T. Galloway, September 25, 1891, Garrett Park, Montgomery County, Md.

28. **Peronospora oxybaphi** Ellis & Kellerman. New Kansas Fungi. <Jour. Mycol., Vol. 1, Manhattan, Jan., 1885, p. 2.

On leaves and petioles of Nyctaginaceæ.

On *Oxybaphus nyctagineus*, Sweet. T. A. Williams, No. 286, May 30, 890, Ashland, Saunders County, Nebr. Conidiophores hypophyllous, on leaves, mature oöspores in petioles.

Subsection *effusæ*.

29. **Peronospora ficariæ** Tulasne. Note sur les champignons entophytes, tels que celui de la Pomme de terre. <Comptes Rend. d. l'Acad d. Sciences, t. 38, Paris, Séance du 26 Juin, 1854, p. 1102–1103.

On leaves of Ranunculaceæ.

On *Ranunculus bulbosus* L. A. B. Seymour, May 12, 1883, Cambridge, Middlesex County, Mass.

On *Ranunculus fascicularis*, M. B. Waite, No. 542, May 31, 1888, Oregon, Ogle County, Ill. Rare.

30. **Peronospora violæ** De Bary. Rech. s. l. développm. de quelq. champ. parasites, <Ann. Sci. Nat., 4^{e} sér. Bot., t. xx, 1863, p. 125 (p. 121 of the reprint).

On leaves of Violaceæ.

On *Viola tricolor* L., var. *arvensis*. S. M. Tracy, April 5, 1888, Starkville, Oktibbeha County, Miss. With nearly or quite mature oöspores in leaves. F. S. Earle, April 13, 1884, Cobden, Union County, Ill. With mature oöspores in stems and leaves.

31. **Peronospora hydrophylli** Waite. Descript. of two new species of Peronospora. <Jour. Mycol., Vol. VII, No. 2, p. 107, pl. XVII, figs. 17–24.

On leaves of Hydrophyllaceæ.

On *Hydrophyllum Virginicum* L. M. B. Waite, No. 559, May 5, 1889, High Island, Montgomery County, Md. M. B. Waite, No. 558, June 1, 1888, Oregon, Ogle County, Ill. A. S. Hitchcock, spring, 1888, Iowa City, Johnson County, Iowa.

32. **Peoronspora dispaci** Tulasne. Note sur les champignons endophytes, tels que celui de la Pomme de terre, <Comptes Rend. de l'Acad. d. Sciences, t. 28, Paris, Séance du 26 Juin, 1854, p. 1102–1103.

On leaves of Dipsaceæ.

On *Dipsacus yylvestris* Mill. C. H. Demetrio, July, 1884, Muench farm, Saline Creek, near Perryville, Perry County, Mo.

33. **Peronospora grisea** Unger. <Bot. Zeit, 1847, p. 315.
1833, *Botrytis grisea* Unger. Die Exanthemen der Pflanzen, p. 172.

On leaves of Scrophulariaceæ.

On *Veronica arvensis* L. M. B. Waite, No. 541, May 7, 1883, Urbana, Champaign County, Ill. With abundant mature oöspores in leaves and stems.

34. **Peronospora lophanthi** Farlow. Enumeration of the Peronosporeæ of the United States, No. 31. <Bot. Gaz., Vol. VIII, No. 11, Nov., 1883, p. 333.

On leaves of Labiatæ.

On *Lophanthus nepetoides* Benth. M. B. Waite, No. 125, May 13, 1885, Urbana, Champaign County, Ill.

35. **Peronospora lamii** A. Braun. <Rabenhorst, Herb. Myc., Ed. 2, No. 325 (1859).

On leaves of Labiatæ.

On *Lamium amplexicaule,* L. W. T. Swingle, No. 4028, May 22, 1891, waste land in old fields 2 miles southeast of Norfolk, Norfolk County, Va. Conidiophores and nearly mature oöspores in leaves. I think these specimens should be referred to *Peronospora lamii.* About the only respect in which the Norfolk specimens differ from European collections I have examined is that the conidiophores are much more scanty. I have compared it with *P. lamii* in Krieger Fungi Sax, 195, on *Lamium purpureum,* L. from Konigsberg, Germany; de Thumen, Mycoth. universalis, No. 721, on *Lamium amplexicaule* from Pasma, Italy; and Saccardo, Mycoth. Veneta, No. 487, on *Lamium purpureum* from Vittorio, Italy.

.36. **Peronospora alta** Fuckel. Fungi rhenani No. 39; Symbolae mycologicae, Beiträge zur Kenntniss der Rheinischen Pilze, p. 71. <Jahrb. Nassauischen Vereins für Naturk., Jahrg. 23 und 24.

On leaves of Plantaginaceæ.

On *Plantago Patagonica* Jacq., var. *aristata* Gr. W. T. Swingle, No. 4032, June 20, 1891, under the trees in a peach orchard, Griffin, Spalding County, Ga. The parasite was very abundant in one orchard on this host, which in some spots seemed to be seriously injured by it.

On *Plantago* Sp. (?) (*P. major* or *P. Rugelii*). M. B. Waite, No. 534, Oregon, Ogle County, Ill.; M. B. Waite, No. 261, June 8, 1888, Oregon, Ogle County, Ill.; J. J. Davis, June 15, 1887, Racine, Racine County, Wis.; E. M. Fisher, No. 60, July 20, 1890, Urmeyville, Johnson County, Ind.; E. M. Fisher, No. 60, September, 1890, Urmeyville, Johnson Couny, Ind.

37. **Peronospora effusa** (Greveille) Rabenhorst. Klotz. herb.viv. myc., No. 1880.
1824. *Botrytis effusa,* Greveille. <Flora edenensis, p. 468.

On leaves of Chenopodiaceæ.

On *Chenopodium album* L. M. B. Waite, No. 264, June 9, 1888, Oregon, Ogle County, Ill. With mature oöspores in dying leaves. M. B. Waite, No. 538, June 23, 1885, Oregon, Ogle County, Ill.; B. D. Halsted, July, 1885, Spirit Lake, Dickinson County, Iowa. With mature oöspores in leaves. W. T. Swingle, No. 4024, May 22, 1891, waste land east of Norfolk, Norfolk County, Va. E. M. Fisher, No. 196, September 17, 1890, Urmeyville, Johnson County, Ind.

38. **Peronospora rumicis** Corda. Icones fungorum hucusque cognitorum, t. i., p. 20, tab. v, f. 273.

On leaves of Polygonaceæ.

On *Polygonum dumetorum,* L. var. *scandens,* Gr. E. M. Fisher, No. 74, July 24, 1890, Urmeyville, Johnson County, Ind. M. B. Waite, No. 272, July 30, 1888, Champaign, Champaign County, Ill. E. M. Fisher, No. 74, September, 1890, Urmeyville, Johnson County, Ind.

39. Peronospora euphorbiæ Fuckel. Fungi rhenani No. 40; Symb. Myc., p. 71.

Conidia and oöspores on leaves and inflorescences at the ends of branches of Euphorbiaceæ.

On *Euphorbia humistrata* Engelm. J. M. Holzinger, No. 67, July 24, 1888, Winona, Winona County, Minn. Conidiophores abundant; hypophyllous on leaves and inflorescences.

On *Euphorbia cordifolia* Ell. E. Bartholomew, No. 435, August 15, 1891, Rockport, Rooks County, Kans. With immature oöspores in stems.

On *Euphorbia hirsuta* Engelm. E. Bartholomew, No. 434, August 10, 1891, Rockport, Rooks County, Kans. With immature oöspores in stems.

On *Euphorbia hypericifolia* L. W. T. Swingle, No. 4025, September 21, 1891. Low ground in a vineyard. Sterling, Loudoun County, Va. Conidiophores amphigenous on leaves. Oöspores sparing; immature in leaves. I found only a single plant attacked with the fungus; and of this plant but one small branch was affected. The leaves bore also *Æcidium euphorbiæ* Pers., and were thus doubly parasitized. The only other *Euphorbia* growing near (*E. corollata, L.*) seemed entirely free from Peronospora.

On *Euphorbia serpyllifolia* Pers. E. Bartholomew, No. 436, August 8, 1891, Rockport, Rooks County, Kans. With nearly mature oöspores in stems. J. M. Holzinger, No. 154, August 22, 1888, Winona, Winona County, Minn. Conidiophores very scarce, but leaves and inflorescences filled with nearly or quite mature oöspores.

§ doubtful.

40. Peronospora cubensis Berkeley & Curtis. Berkeley on a collection of fungi from Cuba, Part II, including those belonging to the families Gasteromycetes, Coniomycetes, Hyphomycetes, Physiomycetes. <Jour. Linn. Soc. Botany, Vol. 10, 1869, p. 363.

On leaves of Cucurbitaceæ.

On *Cucumis anguria.* T. L. Brunk, 1888, College Station, Brazos County, Tex. J. F. Howe, December 12, 1889, Anona, Hillsboro County, Fla.

On *Cucumis sativus.* T. L. Brunk, College Station, Brazos County, Tex. P. H. Dorsett, Garrett Park, Montgomery County, Md. This species did considerable damage this year to a small patch of cucumbers on rather low ground near Garrett Park, Md.

41. Peronospora celtidis Waite. Descript. of two new species of Peronospora. <Jour. Mycol., vol. 7, No. 2, p. 105, pl. XVII, figs. 1-16.

On leaves of Urticaceæ; tribe Celtideæ.

On *Celtis occidentalis* L. M. B. Waite, No. 556, October 7, 1891, Washington, D. C. With mature oöspores in leaves. M. B. Waite, No. 557, October 9, 1891, Washington, D. C. With mature oöspores in leaves. P. H. Dorsett and W. T. Swingle, No. 4026, October 10, 1891, mouth of Sassafras River, Still Pond, Kent County, Md. With mature oöspores in leaves. The specimens included in this number were collected on many individuals of a smooth-leaved form of *Celtis occidentalis,* which had slender, smooth twigs. The trees grew at the edge of a wood at the top of the banks of a small stream. W. T. Swingle, No. 4027, October 10, 1891, Still Pond, Kent County, Md. With mature oöspores in leaves. This number includes leaves from two individuals of a rough-leaved, coarse-twigged form of the host, on which the fungus was rare. One individual was a good-sized tree, growing with those from which No. 4026 was collected; the other (No. 4027*a*) was a small sapling growing by the wayside.

42. Peronospora echinospermi Swingle.

1889. *Peronospora Cynoglossi* Burrill, var. (?) *Echinospermi* Swingle. A list of Kansas species of Peronosporaceæ No. 21. <Trans. of 20 and 21st meetings Kans. Acad. Sci. (1887–1888), Vol. XI, pp. 77–78.

Conidia and oöspores on leaves, stems, and fruits of Borraginaceæ.

On *Echinospermum Redowskii* Lehm., var. *cupulatum* Gr. E. Bartholomew, No. 469, June 10, 1891. Rockport, Rooks County, Kans. Conidiophores on leaves, stems, and calyces; oöspores in mesophyll of leaves, bark, parenchyma, and pith of stems and in walls of nutlets.

On *Echinospermum Redowskii* Lehm., var. *occidentale* Wats. F. W. Anderson, No. 10, May 27, 1887, Helena, Lewis and Clarke County, Mont. Conidia only on leaves. E. Bartholomew, No. 470, June 15, 1891, Rockport, Rooks County, Kans. Conidia on leaves, calyces, and stems; oöspores, bark, parenchyma of stems, and walls of nutlets.

Through the kindness of Mr. Bartholomew I have been able to obtain an abundance of mature oöspores of this form, and after a careful study I feel reasonably certain that it is specifically distinct from *P. cynoglossi* Burrill, to which I referred it as a doubtful variety in 1889.* The oöspores occur in great profusion in the cortical parenchyma of the stems, and occasionally beneath the thickened outer layer in the wall of the nutlets, in mesophyll of leaves and calyces and in pith of stems. It is noticeable that they occur only in thin-walled tissue, and of such tissue they seem to prefer the best nourished. The bark and the seeds, which contain nearly all the oöspores, resist decomposition longest after the death of the plant.

The oöspores are unusually large, in fact the largest I have studied, being 35 to 50 by 33 to 47 μ, mostly 38 to 45 by 36 to 42 μ, in diameter. They are rather dark-brown, nearly globose, have a thick (mostly 2 to 7 μ), brown epispore, whose surface is slightly undulating and furnished with curious markings.

These epispore markings consist of very narrow (one-eighth to one-half μ), irregular, interrupted zigzag lines, which occasionally anastomose. The lines do not appear to be raised markings, such as are common on oöspores of *Peronosporaceæ*, but rather lighter colored portions of the epispore wall.

In sections the epispore has a distinctly radiate structure, seeming to be composed of brown, radiating prisms, between which are narrow stripes of lighter-colored substance.

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* A list of the Kansas species of Peronosporaceae loc. cit. I wish to correct an error on p. 77 of this list. The host plant of *P. cynoglossi* should be *Cynoglossum Virginicum* L., not *C. officinalis* L., as given.

Possibly the lines seen on the surface are due to this lighter colored substance between the prisms. The endospore is 2 to 3 μ thick and homogeneous. Undoubtedly its composition is quite different from that of the epispore. The sphere bounded by the endospore is very constant in size, being 28 to 38 μ, mostly 29 to 34 μ.

The mycelium is very variable in diameter, and is furnished with abundant haustoria. The haustoria are filiform and almost always unbranched. Near the base they are gradually narrowed till, at the point of union with the mycelium, they are only about half as thick as at the distal end. They are usually very much bent and contorted, often appearing like a tangled mass of filaments. They often attain considerable length, sometimes as much as 40 μ.

As I have already described* the conidiophores and conidia I need not speak of them here, except to mention that in examining conidia that had been treated with warm KHO solution, and thus rendered lifelike in shape, I saw a number that had still attached lateral germ tubes. I have, finally, to report a most remarkable form of the conidial fructification in the Montana specimens collected by F. W. Anderson. The conidiophores are less branched than in the Kansas specimens, and the antepenultimate and penultimate branches are shorter and the ultimate are shorter still. All branches are strongly tinged with fuliginous, while the Kansas specimens show only faint traces of coloration in the conidiophores. The most remarkable character of these specimens is the fact that the conidiophores issue from the stomata in dense groups often comprising 10–15 or even more members. In the Kansas specimen of *P. echinospermi* the conidiophores arise singly or more often in groups of 2–5 through the stomata. For the present, till more specimens can be obtained and, if possible, oöspores be found, I think this form had best be referred doubtfully to *P. echinospermi.*

I have compared *P. echinospermi* very carefully with *P. cynoglossi* Burrill and find besides the differences in the conidiophores and conidia which I pointed out in 1889, considerable differences in the oöspores. The oöspores of *P. cynoglossi* differ from those of *P. echinospermi* in being considerably smaller (25–30 μ diameter sec. Burrill, but in what I have measured 27–40 μ mostly 27–34 μ diameter), in having usually a thinner epispore which does not show the peculiar surface markings, and is indistinctly if at all radiate in structure.

Peronospora myosotidis De Bary, and *P. asperuginis* Schroeter, differ from *P. echinospermi* in the conidial fructification in which they approach more nearly *P. cynoglossi.* If the published descriptions are at all to be relied upon the oöspores of these two species are very different from those of *P. echinospermi.* Unfortunately I have not been able to find any oöspores of either of these species in the specimens at my disposal. I append measurements (all given in μ's) of oöspores of *P.*

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*A list of Kansas species of Peronosporaceae, *loc. cit.*, pp. 77–78.

cynoglossi and *P. echinospermi.* Most of the oöspores were measured in actual sections, which were obtained with a microtome, but I also give a number of measurements of *P. echinospermi* in optical section, since it is the usual method of measuring, and therefore gives results more strictly comparable with published measurements of other species. I am, however, convinced that the study of oöspores in actual section offers great advantages over the common method of studying them in optical section.

Table of measurements of ten oöspores of Peronospora cynoglossi, Burrill, *in actual section.*[*]

Diameter of oöspore.	Diameter of oöspores lacking epispore.	Thickness of endospore.	Thickness of epispore.	Diameter of oögonium.
27 by 25	18	1¾	2 –4	30 by 28
27 by 26	21	1¾	2 –4	32 by 30
30 by 26	24	2	2 –3	44 by 31
30 by 28	22	2	1 –3	32 by 29
30 by 28	24	2	2 –4	36 by 32
30 by 29	24	2	2 –4	36 by 30
32 by 30	27	2	1½–4	44 by 32
33 by 31	26	3	1½–3	38 by 32
34 by 31	27	2	2 –3	40 by 34
40 by 33	28	2	2½–5	40 by 35

[*] These oöspores were measured from a specimen on *Cynoglossum Virginicum.* (A. B. Seymour, Illinois State Laboratory of Natural History. No. 4703, May 16, 1882. Sanburn, Ill.) They were measured in actual section in water, as indicated in the other tabulations of measurements given. One division of the eye-piece micrometer equalled 2 μ. All measurements given in μ's. I am indebted to Mr. Waite for this specimen, as well as for the permission to use his whole herbarium for comparisons.

Table of measurements of twenty-five oöspores of Peronospora echinospermi, Swingle, *in optical section.*[†]

Diameter of oöspore.	Diameter of oöspore without epispore.	Thickness of endospore.	Thickness of epispore.	Diameter of oögonium.
*38 by 36	31	2	3½ to 6	54 by 44
39 by 37½	30	1½	3¾ to 6	54 by 45
40 by 39	29	2	2 to 6	60 by 46
*40 by 39	33	2½	3 to 5	58 by 50
40½ by 39	31½	1¾	4½ to 7½	54 by 54
42 by 40½	31½	1½	3 to 6	55½ by 54
42 by 40½	32½	1½	4½ to 7½	63 by 61
*42 by 41	32	1½	4 to 6	76 by 50
43½ by 37½	31½	2¼	4¾ to 9	61½ by 48
43½ by 39	30	2¼	6 to 7½	67½ by 48
43½ by 40½	30	1½	4½ to 9	63 by 42
43½ by 42	30¾	1½	4½ to 6¾	63 by 61½
45 by 42	32	1¾	4 to 7½	66 by 54
45 by 42	36	1½	6 to 9	69 by 55½
45 by 44	33	2½	4 to 6	54 by 52
*45 by 44	34	2½	4 to 5	60 by 56
*46 by 41	32	3	4 to 5	56 by 50
46 by 44	33	2	4 to 6	56 by 52
*46 by 46	35	2½	4	72 by 50
46½ by 45	35¼	2¼	4½ to 7½	61½ by 52½
48 by 48	38	2½	4 to 5	72 by 54
*50 by 48	40	2½	3 to 5	78 by 60
51 by 40½	30	1½	4½ to 9	57 by 48
51 by 45	36	1½	6 to 11½	63 by 54
57 by 45	35¼	2¼	6 to 13½	69 by 60

[†] These specimens were measured from oöspores teased out of the tissues from the same specimens and in the same manner as indicated in the following table of measurements. One division of the eye-piece micrometer equaled 2 μ. All were from *Echinospermum Redowskii* Lahm, var. *occidentale* Wats. except those marked with an asterisk (*), which were from *E. Redowskii* Lehm, var. cupulatum, Gr. All measurements in μ's.

Table of measurements of fifty oöspores of Peronospora echinospermi Swingle, *in actual section.**

Diameter of oöspore.	Diameter of oöspores without epispore.	Thickness of endospore.	Thickness of epispore.	Diameter of oögonium.
35 by 34	28 by 27	2	2½ to 2¾	40 by 38
36 by 33	32 by 28	2	3 to 4	54 by 40
36 by 34	28 by 27	2½	3 to 4	46 by 38
36 by 35	29 by 29	2½ to 3	2 to 4	44 by 38
36 by 36	28 by 28	2	3 to 6	52 by 44
38 by 33	29 by 27	2½	3 to 4	54 by 40
38 by 36	29 by 29	2½	2¾ to 4	46 by 44
38 by 36	30 by 30	2½ to 3	3 to 5	47 by 22
38 by 37	30½ by 30½	2	3 to 4	50 by 40
39 by 34	31 by 27	2½	2½ to 4	48 by 36
39 by 38	30 by 30	2½	2½ to 4	62 by 46
40 by 34	30 by 30	2¾	3 to 4	46 by 40
*40 by 35	32 by 28	2½	4 to 4½	50 by 42
40 by 36	32 by 26	2	3 to 4	59 by 41
40 by 37	30 by 30	2	4 to 7	46 by 40
40 by 38	32 by 32	2	2¾ to 5	57 by 42
40 by 39	29 by 29	2½	5 to 6	50 by 46
40 by 39	30 by 30	3	4 to 5	68 by 46
40 by 40	29 by 29	2½	4½ to 8	54 by 50
40 by 40	31 by 31	2	4 to 5	48 by 42
40½ by 39	31 by 31	3	4 to 6	54 by 50
41 by 38	30 by 30	2	4 to 6	70 by 40
41 by 40	30 by 30	2½	2¾ to 5	54 by 42
41 by 40	31½ by 28	2	4 to 6	62 by 42
*42 by 34	32 by 25	2	4½ to 4	52 by 38
42 by 38	28½ by 28½	2	4 to 6	44 by 42
42 by 38½	29 by 29	2	2½ to 10½	54 by 54
42 by 38½	30 by 28	2	4 to 8	52 by 44
42 by 38½	31 by 30	2 to 2½	4 to 6½	52 by 46
42 by 40	30 by 30	2	3 to 8	50 by 46
42 by 40	30 by 30	2½	4 to 6	46 by 44
*42 by 40	31 by 31	2½	4 to 5	50 by 50
42 by 42	30 by 30	3	4 to 6	58 by 52
43 by 42	30 by 30	2 to 2½	4½ to 5	50 by 48
44 by 40	32 by 32	2½ to 3	4 to 7	54 by 48
44 by 40	34 by 31	2	2¾ to 4	52 by 46
*44 by 40	34 by 31	2½	4 to 5	62 by 60
*44 by 40	36 by 32	2½	3¾ to 4	56 by 50
*44 by 41	33 by 32	2½	4 to 4½	54 by 44
*44 by 41	33 by 32	2	4 to 5	50 by 46
44 by 42	32 by 32	2 to 2½	4 to 6	50 by 48
44½ by 40	32 by 32	3	5 to 6	54 by 42
44½ by 42	31½ by 31½	2 to 2½	4½ to 7½	60 by 52
45 by 45	34 by 34	4	4 to 5	64 by 54
46 by 41	31 by 31	2½	4 to 5	52 by 48
46 by 42	31 by 31	2	4½ to 7½	59 by 52
*46 by 42	33 by 31	3	4 to 6	60 by 46
48 by 45	35 by 35	2½	4 to 7	59 by 51
48 by 47	34 by 34	2½	4 to 8	60 by 52
50 by 45	38 by 38	4	4 to 6	64 by 62
Extremes.				
35 to 50 by 33 to 47	28 by 28 to 38 by 38	2 to 4	2½ to 10½	40 to 64 by 22 to 62
Most common sizes.				
38 to 45 by 36 to 42	29 by 29 to 34 by 34	2 to 3	2½ to 7	46 to 60 by 42 to 52

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* All the measurements are from actual sections made through the middle portions of the oöspores. The specimens were treated with hot water first, and were afterward studied in water alone. In measuring, Zeiss's 2mm. homog. immers. obj., 6 compen. ocular, etc., were used, and with a tubelength of 159½ mm.; one division of the eyepiece equaled 2μ. These measurements were all made from specimens collected by E. Bartholomew. All were from specimens collected on *Echinospermum Redowskii* Lehm., var. *occidentale* Wats. Collected June 15, 1891, except those marked with an asterisk (*), which were on *E. Redowskii*, var. *cupulatum* Gr., collected June 10, 1891. All measurements given in μ's.

43. **Peronospora claytoniæ** Farlow. Enumeration of the Peronosporeæ of the United States, No. 11, <Bot. Gaz., vol. VIII, No. 10, October, 1883, p. 314.

On leaves of Portulacaceæ.

On *Claytonia Virginica* L. M. Varney, April 28, 1891, Piney Branch, Rock Creek, D. C.

44. **Peronospora rubi.** Rabenhorst, Fungi europæi, No. 2676. (1882.)

On leaves of Rosaceæ, tribe Rubeæ.

On *Rubus villosus* Ait. M. B. Waite, No. 270, September 8, 1888, Oregon, Ogle County, Ill. M. B. Waite, No. 271, September 10, 1888, Oregon, Ogle County, Ill. M. B. Waite, No. 279, September 10, 1889, Oregon, Ogle County, Ill. M. B. Waite, No. 560, Oct. 7, 1891, Zoolog. Park, Washington, D. C.

On *Rubus Canadensis* L. P. H. Dorsett and W. T. Swingle, No. 4029, October 29, 1891, Garrett Park, Montgomery County, Md. W. T. Swingle, No. 4030, October 29, 1891, Rockville, Montgomery County, Md. B. T. Galloway and P. H. Dorsett, November 8, 1891, Garrett Park, Montgomery County, Md. In the fall of 1891 many of the individuals of this host showed the bright red spots caused by the parasite.

45. **Peronospora sparsa** Berkeley. <Gard. Chron. and Agric. Gaz., London, April 5, 1862, pp. 307 and 308 with fig.

On leaves of Rosaceæ, tribe Roseæ.

On *Rosa* sp. cult. D. G. Fairchild, June, 1891, in greenhouse Geneva, Ontario County, N. Y. Mr. Fairchild reports this species as very destructive, completely defoliating the plants. Bordeaux mixture was afterward used with good success in preventing it.

46. **Peronospora sordida** Berkeley & Broome. Notices of British Fungi, No. 953. <Ann. and Mag. Nat. His., 3d ser., vol. VII, London, June, 1861, p. 449.

On leaves of Scrophulariaceæ.

On *Scrophularia nodosa* L. C. H. Demetrio, June, 1889, Sweet Springs, Saline County, Mo. M. B. Waite, No. 536, August 25, 1888, Urbana, Champaign County, Ill. M. B. Waite, No. 543, September 11, 1888, Rochelle, Ogle County, Ill. M. B. Waite, No. 317, September 14, 1889, Oregon, Ogle County, Ill. M. B. Waite, No. 142, September, 1889, Oregon, Ogle County, Ill.

NEW SPECIES OF FUNGI.

By J. B. ELLIS and B. M. EVERHART.

PUCCINIA SUKSDORFII, *n. sp.*—On leaves of *Troximon glaucum*. Washington (Suksdorf) and Helena, Mont. (Kelsey). I and II not seen; (III) sori small, black, naked almost from the first, subconfluent, amphigenous, the leaf often marked with a small round purplish spot on the side opposite the sori. Teleutospores short-elliptical, obtuse and broadly rounded at both ends, deep brown, granular-roughened all over as if sprinkled with minute grains of sugar, constricted at the septum; 40–50 × 25–30 μ, on pedicels scarcely longer than the spores.